

## SIT-LOCK® self locking elements

### Advantages of SIT-LOCK® on the shaft-hub connection compared with traditional systems

#### Easy assembly and disassembly

Both actions take place by locking and unlocking the clamping screws with common tools.  
The use of a torque wrench is only necessary when a more precise torque is required.

#### Superior holding power

The action of the clamping cones creates shaft clamping torque superior to a normal keyed hub.

#### Overload protection

When the pre-set torque is exceeded SIT-LOCK® will slip, preventing the connected elements from being broken.

Note: SIT-LOCK® units are not friction couplings so, excessive slip will cause damage.

#### Easy adjustment

Combining the SIT-LOCK® design of smooth cone action with superior holding power, the hub can be clamped at any position along a shaft, eliminating the need for lock washers, spacers, stop rings, etc.

#### Precision location

With the SIT-LOCK® smooth cone action, the SIT-LOCK® is ideal for clamping cams, timing devices, and indexing mechanisms accurately and precisely.

#### Temperature

-20 °C ÷ 150 °C

#### Unlimited use possibilities

SIT-LOCK® units are suitable to connect any type of hub (flywheels, chainwheels, gears, levers, pulleys, eccentrics, coupling, etc).

#### Various solutions in stock

Available in stock in 10 different types, SIT-LOCK® units can be utilized in a varied range of industrial applications

#### Order form

SIT-LOCK®	CAL	1	F25 /50
CAL: SIT-LOCK® self locking element			
Type			
Shaft diameter			
External diameter (hub bore)			

### Performances

Given values of transmissible torque, axial force, and pressure between shaft and hub are valid for a lubricated installation (friction coefficient  $\mu=0,12$ ). Both hub and shaft, as well as locking unit's contact surfaces and screws, should be lubricated.

Locking unit and screws are supplied already oiled.

Always consider tolerances and roughness values per single locking unit.

**To avoid decrease of locking unit performances, do not use molybdenum disulfide lubricant or other substances that drastically reduce coefficient of friction.**

### Design procedure

For a correct functioning of SIT-LOCK®, the transmissible torque  $M_T$  (stated in this catalogue) must always exceed the maximum torque in operation. So, in selecting the SIT-LOCK® dimensions, you must consider the start up torque could be even 4 times larger than the nominal one.

The transmissible axial forces ( $F_{ax}$ ) given in the tables are valid for cases where there is no torque. If it is necessary to transmit both a torque and an axial force (ex. helical gear), the following formula must be used:

$$M_T \geq \sqrt{M_a^2 + \left(\frac{F_{ax} \cdot d}{2000}\right)^2} \quad [Nm]$$

where:

$M_a$  = maximum torque to be transmitted [Nm]

$F_{ax}$  = axial force in operation [N]

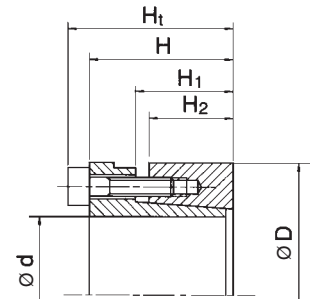
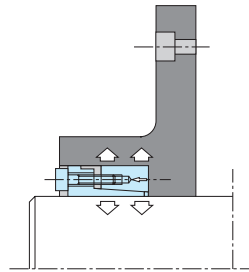
$d$  = shaft diameter [mm]



## SIT-LOCK® 5A - Self-Centering without Flange

Locking assembly with single taper design. It is suitable for high torques. Provide good concentricity and self centring. A small axial movement of the hub during the installation operation

may occur. Applications in need of an accurate axial positioning are not recommended with this type of locking assembly.



### Installation

Carefully clean contact surfaces of shaft and hub. Then, lightly oil both surfaces with standard mineral oil. Position the SIT-LOCK® on the shaft and into the hub machined bore. Align them as required by the application. Gradually and uniformly tighten the locking screws to the tightening torque (Ms).

You must tighten the screws in diametrically opposite sequence in stages:

- hand tighten the screws until the surfaces are in contact

- carefully check the position of the hub on the shaft
- tighten the screws to half the value of the tightening torque (Ms) stated in the catalogue
- repeat the operation until the tightening torque is reached using the dynamometric screw-driver
- check every locking screw to insure it has been tightened to the specific tightening torque

*Do not use lubricant like "Molykote" or molybdenum disulfide based oils.*

### Removal

Gradually loosen all locking screws. Remove and transfer the screws into the releasing tapped holes and tighten them until the SIT-LOCK® is released.

*Note: To reuse the locking element, carefully oil the screws and the conical surfaces, then follow installation instructions.*

### Concentricity

For self-centering locking assemblies the clamping element has a centering effect and the concentricity error can be considered 0.02-0.04 mm.

<b>Maximum allowable roughness</b>
Rt 16 µm
<b>Maximum recommended tolerance</b>
shaft h 8 - hub H 8

SIT-LOCK® 5A

Dimensions [mm]					Performances		Pressure [N/mm <sup>2</sup> ]		Clamping screws (DIN 912 - 12,9)		
d x D	H <sub>t</sub>	H	H <sub>1</sub>	H <sub>2</sub>	M <sub>T</sub> [Nm]	F <sub>ax</sub> [kN]	p <sub>w</sub>	p <sub>n</sub>	N°	Type	M <sub>s</sub> [Nm]
20 x 47	49	43	30	26	547	55	279	119	6	M6	17
22 x 47	49	43	30	26	602	55	254	119	6	M6	17
24 x 50	49	43	30	26	657	55	233	112	6	M6	17
25 x 50	49	43	30	26	684	55	223	112	6	M6	17
28 x 55	49	43	30	26	766	55	199	101	6	M6	17
30 x 55	49	43	30	26	821	55	186	101	6	M6	17
32 x 60	49	43	30	26	1.313	82	262	140	9	M6	17
35 x 60	49	43	30	26	1.436	82	239	140	9	M6	17
38 x 65	49	43	30	26	1.559	82	220	129	9	M6	17
40 x 65	49	43	30	26	1.641	82	209	129	9	M6	17
42 x 75	60	52	35	30	2.123	101	213	119	6	M8	41
45 x 75	60	52	35	30	2.275	101	199	119	6	M8	41
48 x 80	60	52	35	30	2.426	101	186	112	6	M8	41
50 x 80	60	52	35	30	2.527	101	179	112	6	M8	41
55 x 85	60	52	35	30	4.170	152	244	158	9	M8	41
60 x 90	60	52	35	30	4.549	152	223	149	9	M8	41
65 x 95	60	52	35	30	4.928	152	206	141	9	M8	41
70 x 110	67	57	46	40	6.555	187	177	113	7	M10	83
75 x 115	67	57	46	40	7.023	187	166	108	7	M10	83
80 x 120	67	57	46	40	7.491	187	155	103	7	M10	83
85 x 125	67	57	46	40	9.096	214	167	114	8	M10	83
90 x 130	67	57	46	40	9.631	214	158	109	8	M10	83
95 x 135	67	57	46	40	12.708	268	187	131	10	M10	83
100 x 145	78	66	53	46	13.634	273	157	108	7	M12	145
110 x 155	80	68	52	45	17.931	326	175	124	8	M12	145
120 x 165	80	68	52	45	24.452	408	200	146	10	M12	145
130 x 180	80	68	52	45	31.787	489	222	160	12	M12	145
140 x 190	90	76	58	50	39.141	559	212	156	10	M14	230
150 x 200	90	76	58	50	50.325	671	237	178	12	M14	230
160 x 210	90	76	58	50	53.680	671	222	170	12	M14	230
170 x 225	90	76	58	50	66.540	783	244	185	14	M14	230
180 x 235	90	76	57	50	70.455	783	231	177	14	M14	230

Notes:

Dimensions representing the total length of the hub are indicative; they are calculated according to the geometric rules.

For assemblies requiring larger dimensions, contact our Technical Department.

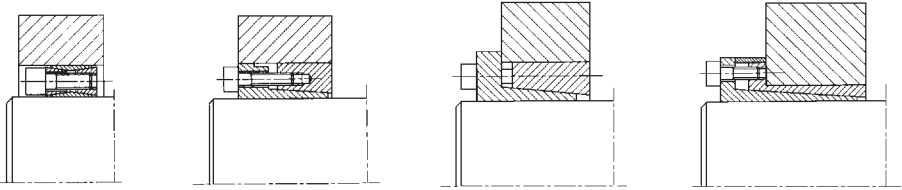
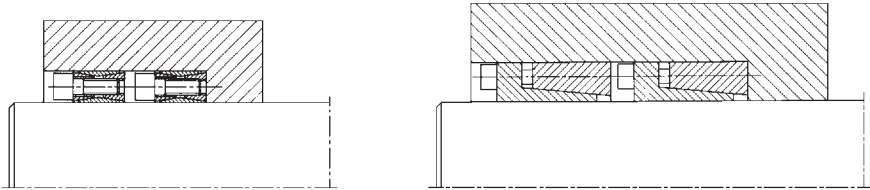
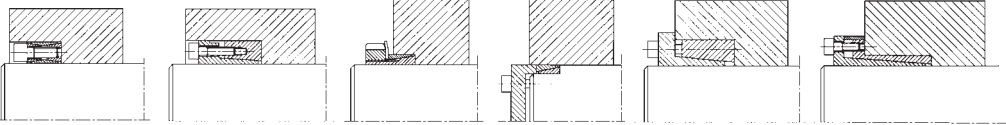
It is possible to decrease the screws tightening torque M<sub>s</sub> by up to 40% of the value stated in the table. Consequently, M<sub>T</sub>, F<sub>ax</sub>, P<sub>w</sub> and P<sub>n</sub> will decrease proportionally.

M <sub>s</sub>	Screw tightening torque	Nm
M <sub>T</sub>	Transmissible torque moment	Nm
F <sub>ax</sub>	Transmissible axial load	N
p <sub>w</sub>	Shaft pressure	N/mm <sup>2</sup>
p <sub>n</sub>	Hub pressure	N/mm <sup>2</sup>

## Design of hub outside minimum diameter

When using the locking units, the shaft-hub connection is characterized by a pressure on the hub surface, which is exerted by the locking unit outer ring when the clamping screws are tightened to the stated value. It is important to design correctly the hub outside diameter. The following table summarizes the procedure as a simple calculation. To determine the hub outside minimum

diameter, simply multiply the factor K by the SIT-LOCK® outside diameter to obtain the hub outside minimum diameter. The factor K varies depending on the yield limit of hub material, the hub surface pressure (Pn) and the factor (x), variable according to the application type (A, B, C).

<p>Installation type A (<math>L_M \cong L_C</math>) X = 1</p> 
<p>Installation type B (<math>L_M \cong 2 L_C</math>) X = 0,8</p> 
<p>Installation type C (<math>L_M &gt; 2 L_C</math>) X = 0,6</p> 
<p><b>Hub min diameter <math>D \times K</math></b> for: K = factor stated in the table D = SIT-LOCK® outside diameter</p>

$L_M$	Hub length	mm
$L_C$	SIT-LOCK® length	mm

### Hollow shaft

For application with locking-assemblies on hollow shaft, it is important to scale both hub minimum diameter and hollow

shaft diameter. Contact our Technical Department for design.

# Coefficient K

Hub surface pressure		Yield limit of hub material $\sigma_{02}$ [N/mm <sup>2</sup> ]										
		150	180	200	220	250	270	300	350	400	450	600
		Hub material										Heat treatment steel
$P_n$ [N/mm <sup>2</sup> ]	Application	GG 20	GG 25 GS 38	GG 30 GTS 35	GS 45 ST 37-2	GG 40 GS 52	ST 50-2 C 35	GG 50 GS 60 ST 60-2	GG 60 GS 62 ST 70-2	GG 70 GS 70 C 60		
60	C	1,29	1,26	1,21	1,19	1,16	1,15	1,13	1,11	1,10	1,09	1,07
	B	1,40	1,31	1,25	1,24	1,23	1,21	1,19	1,16	1,13	1,12	1,09
	A	1,53	1,43	1,37	1,33	1,29	1,26	1,23	1,19	1,17	1,15	1,11
65	C	1,31	1,26	1,23	1,21	1,19	1,16	1,14	1,12	1,11	1,10	1,08
	B	1,45	1,36	1,31	1,29	1,25	1,23	1,21	1,17	1,15	1,13	1,10
	A	1,61	1,46	1,41	1,36	1,31	1,29	1,25	1,21	1,19	1,17	1,13
70	C	1,35	1,27	1,25	1,23	1,19	1,17	1,16	1,13	1,12	1,11	1,08
	B	1,49	1,39	1,35	1,31	1,26	1,24	1,21	1,19	1,16	1,14	1,11
	A	1,66	1,51	1,46	1,41	1,35	1,31	1,26	1,23	1,21	1,18	1,14
75	C	1,31	1,29	1,26	1,24	1,21	1,19	1,16	1,15	1,13	1,12	1,09
	B	1,53	1,43	1,37	1,33	1,29	1,26	1,23	1,19	1,17	1,15	1,12
	A	1,75	1,56	1,49	1,43	1,37	1,34	1,31	1,26	1,21	1,19	1,14
80	C	1,40	1,32	1,29	1,26	1,22	1,21	1,19	1,16	1,14	1,12	1,09
	B	1,59	1,46	1,40	1,36	1,31	1,28	1,25	1,21	1,19	1,16	1,12
	A	1,82	1,62	1,54	1,47	1,40	1,37	1,32	1,27	1,23	1,21	1,15
85	C	1,43	1,35	1,31	1,28	1,24	1,22	1,20	1,17	1,15	1,13	1,10
	B	1,64	1,50	1,43	1,39	1,33	1,30	1,27	1,23	1,20	1,17	1,13
	A	1,91	1,68	1,58	1,51	1,43	1,40	1,35	1,29	1,25	1,22	1,16
90	C	1,47	1,37	1,33	1,29	1,26	1,23	1,21	1,18	1,16	1,14	1,10
	B	1,70	1,54	1,47	1,41	1,35	1,32	1,29	1,24	1,21	1,19	1,14
	A	2,01	1,74	1,63	1,55	1,47	1,42	1,37	1,31	1,27	1,23	1,17
95	C	1,50	1,40	1,35	1,31	1,27	1,25	1,22	1,19	1,16	1,15	1,11
	B	1,76	1,58	1,50	1,44	1,38	1,35	1,31	1,26	1,22	1,20	1,15
	A	2,12	1,81	1,69	1,60	1,50	1,45	1,40	1,33	1,28	1,25	1,18
100	C	1,54	1,42	1,37	1,33	1,29	1,26	1,23	1,20	1,17	1,15	1,12
	B	1,82	1,62	1,54	1,47	1,40	1,37	1,32	1,27	1,23	1,21	1,15
	A	2,25	1,88	1,74	1,64	1,54	1,49	1,42	1,35	1,30	1,26	1,19
105	C	1,57	1,45	1,40	1,35	1,30	1,28	1,25	1,21	1,18	1,16	1,12
	B	1,89	1,67	1,57	1,51	1,43	1,39	1,34	1,29	1,25	1,22	1,16
	A	2,39	1,96	1,80	1,69	1,57	1,52	1,45	1,37	1,32	1,28	1,20
110	C	1,61	1,48	1,42	1,37	1,32	1,29	1,26	1,22	1,19	1,17	1,13
	B	1,97	1,72	1,61	1,54	1,45	1,41	1,36	1,30	1,26	1,23	1,17
	A	2,56	2,05	1,87	1,74	1,61	1,55	1,48	1,39	1,34	1,29	1,21
115	C	1,65	1,51	1,44	1,37	1,34	1,31	1,27	1,23	1,20	1,18	1,13
	B	2,05	1,77	1,65	1,57	1,48	1,44	1,38	1,32	1,27	1,24	1,18
	A	2,76	2,14	1,94	1,80	1,65	1,59	1,51	1,42	1,35	1,31	1,22
120	C	1,70	1,54	1,47	1,40	1,35	1,32	1,29	1,24	1,21	1,19	1,14
	B	2,14	1,82	1,70	1,61	1,51	1,46	1,40	1,34	1,29	1,25	1,19
	A	3,01	2,25	2,01	1,85	1,70	1,62	1,54	1,44	1,37	1,32	1,23
125	C	1,74	1,57	1,49	1,44	1,37	1,34	1,30	1,25	1,22	1,19	1,14
	B	2,25	1,88	1,74	1,64	1,54	1,49	1,42	1,35	1,30	1,26	1,19
	A	3,33	2,36	2,09	1,92	1,74	1,66	1,57	1,46	1,39	1,34	1,25
130	C	1,79	1,60	1,52	1,46	1,39	1,36	1,31	1,26	1,23	1,20	1,15
	B	2,36	1,94	1,79	1,68	1,57	1,51	1,45	1,37	1,31	1,28	1,20
	A	3,75	2,50	2,18	1,98	1,79	1,70	1,60	1,49	1,41	1,36	1,26
135	C	1,84	1,62	1,55	1,48	1,41	1,37	1,33	1,28	1,24	1,21	1,16
	B	2,49	2,01	1,84	1,72	1,60	1,54	1,47	1,39	1,33	1,29	1,21
	A	4,37	2,66	2,28	2,05	1,84	1,74	1,63	1,51	1,43	1,37	1,27
140	C	1,89	1,67	1,57	1,51	1,43	1,39	1,34	1,29	1,25	1,22	1,16
	B	2,64	2,08	1,89	1,76	1,63	1,55	1,49	1,40	1,34	1,30	1,22
	A	5,40	2,84	2,39	2,13	1,89	1,79	1,67	1,54	1,45	1,39	1,28
145	C	1,95	1,70	1,60	1,53	1,45	1,41	1,36	1,30	1,26	1,23	1,17
	B	2,81	2,16	1,95	1,81	1,66	1,59	1,51	1,42	1,36	1,31	1,23
	A	7,67	3,06	2,51	2,22	1,95	1,83	1,70	1,56	1,47	1,41	1,29
150	C	2,01	1,74	1,63	1,55	1,47	1,42	1,37	1,31	1,27	1,24	1,17
	B	3,01	2,25	2,01	1,85	1,70	1,62	1,54	1,44	1,37	1,32	1,24
	A	—	3,33	2,66	2,31	2,01	1,88	1,74	1,59	1,49	1,42	1,30
155	C	2,07	1,78	1,66	1,58	1,49	1,44	1,39	1,32	1,28	1,25	1,18
	B	3,26	2,34	2,07	1,90	1,73	1,66	1,56	1,46	1,39	1,34	1,24
	A	—	3,67	2,81	2,41	2,07	1,93	1,78	1,62	1,52	1,44	1,31
160	C	2,14	1,82	1,70	1,61	1,51	1,46	1,40	1,34	1,29	1,25	1,19
	B	3,56	2,44	2,14	1,95	1,77	1,68	1,59	1,48	1,40	1,35	1,25
	A	—	4,13	3,01	2,53	2,14	1,99	1,82	1,65	1,54	1,48	1,32
165	C	2,22	1,87	1,73	1,63	1,53	1,48	1,42	1,35	1,30	1,26	1,19
	B	3,97	2,56	2,22	2,01	1,81	1,72	1,61	1,50	1,42	1,36	1,26
	A	—	4,81	3,24	2,66	2,22	2,05	1,87	1,68	1,56	1,48	1,34

Note:  $p_n$  is stated in the dimensional table of each of the locking assemblies. Installation type (A, B, C) are stated in the previous page.

## Example of calculation procedure

### Design data

- Power transmission element to be connected: V-pulley
- Shaft diameter: 50 mm
- Maximum Torque in operation (Ma): 1.500 Nm
- V-pulley material: cast iron GG20
- Yield limit of V-pulley material: 150 N/mm<sup>2</sup>

### Calculation

- SIT-LOCK<sup>®</sup> type: for this kind of application SIT-LOCK<sup>®</sup> 1 is suggested
- Size selection: 50 x 80 mm (see table SIT-LOCK<sup>®</sup> 1)
- Performance control: verify  $M_T \geq M_a$   
From the table obtain  $M_T = 1.889$  Nm, so the above condition is verified
- Tolerance: h11 for the shaft - H11 for the SIT-LOCK<sup>®</sup> bore
- Roughness:  $R_t \leq 16$
- Screws tightening torque:  $M_s = 37$  Nm (see table SIT-LOCK<sup>®</sup> 1)
- Hub surface pressure: from the table you can find the value  $P_n = 125$  N/mm<sup>2</sup>
- Application type: in this case it is preferable to adopt the application "C" with the centering guide between shaft and hub

- Coefficient K : obtained through the table "Coefficient K" by considering the following information:
  - yield limit of hub material = 150 N/mm<sup>2</sup>
  - hub surface pressure = 125 N/mm<sup>2</sup>
  - installation C
 Then,  $K = 1,74$

- Hub outside minimum diameter:

$$\text{Hub } D_{\min} \geq D \cdot K$$

for

- D = SIT-LOCK<sup>®</sup> outside diameter [mm]
- K = 1,74

Then, hub  $D_{\min} = (80 \cdot 1,74) = \mathbf{140 \text{ [mm]}}$

## DIN 912

Screw diameter	P <sub>v</sub> [N]			M <sub>s</sub> [Nm]		
	8,8	10,9	12,9	8,8	10,9	12,9
M2,5	1.600	2.140	2.565	0,76	1,0	1,2
M3	2.210	3.110	3.730	1,3	1,9	2,2
M4	3.900	5.450	6.550	2,9	4,1	4,9
M5	6.350	8.950	10.700	6	8,5	10
M6	9.000	12.600	15.100	10	14	17
M7	13.200	18.500	22.200	16	23	28
M8	16.500	23.200	27.900	25	35	41
M9	22.000	30.900	37.100	36	51	61
M10	26.200	36.900	44.300	49	69	83
M12	38.300	54.000	64.500	86	120	145
M14	52.500	74.000	88.500	135	190	230
M16	73.000	102.000	123.000	210	295	355
M18	88.000	124.000	148.000	290	405	485
M20	114.000	160.000	192.000	410	580	690
M22	141.000	199.000	239.000	550	780	930
M24	164.000	230.000	276.000	710	1.000	1.200
M27	215.000	302.000	363.000	1.050	1.500	1.800
M30	262.000	368.000	442.000	1.450	2.000	2.400